Claims:

1. A method for handling an optical pulse signal by ensuring at least one operation from the following: pulse shaping, treatment of nonlinearity and monitoring, the method comprising steps:

providing a signal handling device capable of performing a cascaded second harmonic generation (SHG) with respect to a particular fundamental harmonic (FH),

selecting an optical path length in said signal handling device, suitable for performing at least one of said operations with respect to an incoming optical pulse signal carried by a wavelength defined by said particular fundamental harmonic (FH),

conveying the incoming optical pulse signal carried by said wavelength along the selected optical path in said signal handling device,

obtaining from said signal handling device at least one output optical pulse signal from a list comprising:

- an output optical pulse signal at the fundamental harmonic (FH), wherein the treatment of nonlinearity and/or the pulse shaping are performed,
- an output optical pulse signal at the second harmonic (SH) for further monitoring it and judging about said input optical pulse signal.

2. The method according to Claim 1, enabling the operation of nonlinearity treatment, wherein at the selecting step such an optical path length is selected for conveying the incoming optical pulse signal with a known amplitude via the signal handling device, that is substantially close to the length upon passing which the output optical pulse signal at the fundamental harmonic (FH) reaches the maximum peak power.

3. The method according to Claim 1, ensuring the operation of pulse shaping, wherein at the selecting step such an optical path length is selected for conveying the incoming optical pulse signal with a known amplitude via the signal handling device, that is substantially close to the shortest optical path

length upon passing which the output optical pulse signal at the fundamental harmonic (FH) reaches the maximum peak power.

4. The method according to Claim 1, allowing for the monitoring operation, wherein the selecting step comprises selecting such an optical path length for conveying the incoming optical pulse signal via the signal handling device, that enables obtaining from said device the output optical pulse signal at the second harmonic (SH) with a non-zero peak power.

5. The method according to Claim 1, wherein the conveying is performed by passing the signal along a multi-segment trajectory in said device, thereby arranging an extended optical path.

6. The method according to Claim 5, wherein the conveying is performed via a multi-segment "zig-zag" trajectory by arranging one or more internal reflections in the signal handling device.

7. The method according to Claim 2, for nolinearity compensation, further comprising a preliminary step of ensuring that the sign of the Kerr effect created by said device to said wavelength is negative.

8. The method according to Claim 1, for gradual handling of the optical signal in a fiber optic link, comprising an additional step of conveying the outgoing optical signal via a chain including at least one additional signal handling device, and wherein the devices in the chain are spanned by sections of the fiber optic link.

9. The method according to Claim 1, for handling optical pulse signals in a multi-channel transmission of optical data where each of the optical channels transmits a specific optical signal at a particular optical wavelength, comprising performing steps of Claim 1 with respect to each particular optical channel.

10. The method according to Claim 9, comprising conveying the optical pulse signals of different said optical channels via respective different said signal handling devices.

11. The method according to Claim 9, comprising conveying the optical pulse signals of different said optical channels via one and the same common signal handling device.

12. The method according to Claim 9, comprising selecting optical channels with better results of the signal handling for transmitting information having higher priority.

13. A device for handling an optical pulse signal from the point of at least one of the following operations: pulse shaping, treatment of nonlinearity and signal monitoring,

the device being capable of performing a cascaded second harmonic generation (SHG) with respect to a particular fundamental harmonic (FH),

the device being characterized by such an optical path length selected for an incoming optical pulse signal carried by a wavelength defined by said particular fundamental harmonic (FH), that upon conveying said incoming optical pulse signal along the selected optical path, the device enables obtaining at least one output optical pulse signal from a list comprising:

- an output optical pulse signal at the fundamental harmonic (FH), wherein the treatment of nonlinearity and/or the pulse shaping are performed,
- an output optical pulse signal at the second harmonic (SH) suitable for further monitoring and judging about said input optical pulse signal.

14. The device according to Claim 13, suitable for pulse shaping and having the optical path length close to the shortest one upon passing which the outgoing FH optical pulse signal reaches the maximum peak power.

15. The device according to Claim 13, comprising a second-harmonic-generating (SHG) element selected from a non-exhaustive list including: a second harmonic generating (SHG) optical crystal and a second harmonic generating (SHG) polymer fiber.

16. The device according to Claim 15, wherein said SHG element constitutes an SHG optical crystal selected from a non-exhaustive list comprising KTP, KDP and BBO.

17. A device for handling an optical pulse signal, if applied at a particular wavelength, from the point of at least one of the following operations: pulse shaping, treatment of nonlinearity and signal monitoring;

the device comprising an SHG element for performing a cascaded Second Harmonic Generation with respect to a Fundamental Harmonic (FH) defined by said particular wavelength,

said element being covered by mirror surfaces at least at its two opposite facets and leaving at least two windows at said opposite facets for an incoming optical beam and an outgoing optical beam respectively, the arrangement being such to create one or more internal reflections of the optical beam if passing between said two windows, thereby providing an extended internal optical path.

18. The device according to Claim 17, wherein said extended internal optical path has the length suitable for obtaining an outgoing optical pulse signal on the fundamental harmonic (FH) with a peak power close to maximum and/or an outgoing optical pulse signal on the second harmonic (SH) with a non-zero peak power.

19. The device according to Claim 18 suitable for pulse shaping, the device having substantially the shortest length of the extended internal optical path, upon passing which the outgoing FH optical pulse signal reaches the maximum peak power.

20. The device according to Claim 17, wherein the element has a cubic form and is covered at its two opposite facets by mirror surfaces leaving two windows at said opposite facets for an incoming optical beam and an outgoing optical beam respectively, the windows being arranged to obtain an extended optical path of the optical beam through the element.

21. The device according to Claim 17, provided with more than two windows for incoming and outgoing beams, thereby enabling selection and activation of any pair of such windows for adjusting length of said internal optical path.

22. The device according to Claim 17, further provided with collimators associated with said windows and serving for adjusting the incident angle of the light beam.

23. The device according to Claim 17, adapted for signal handling in a multi-channel transmission format wherein multiple channels transmit optical signals at respective wavelengths differing from each other, said device being capable of Second Harmonic Generation (SHG) with respect to the wavelengths of more than one channels of said format.

24. The device according to Claim 23, wherein the pulse treatment device, being capable of SHG with respect to the wavelengths of a number of the multiple optical channels, is divided into the number of layers for respectively conveying there-through optical signals of said number of the multiple optical channels.

25. The device according to Claim 24, wherein the layers are separated from one another geometrically.

26. The device according to Claim 25, wherein the layers are separated from one another by wavelength filtering means.

27. The device according to Claim 17, integrated with an optical amplifier and placed immediately after said amplifier.

28. A system for handling optical signals passing via optical fiber links from the point of pulse shaping, nonlinearity treatment and/or monitoring, the system comprising two or more signal handling devices according to Claim 13 or 17, inserted in one or more optical fiber links and operative to perform pulse shaping, nonlinearity treatment and/or monitoring with respect to at least one optical pulse signal.

29. A method for designing a device for handling optical signals from the point of at least one operation from a list comprising nonlinearity treatment, pulse shaping and monitoring of an optical pulse if applied to the device at a particular wavelength, the method comprising:

selecting a Second Harmonic Generating (SHG) element for the device, sensitive to a fundamental harmonic (FH) defined by the particular wavelength;

selecting, by a suitable calculation, at least one relation between amplitude of the pulse to be applied to the pulse-treatment device at said wavelength and an optical path to be passed in the device to ensure either the maximum output peak power of an outgoing pulse signal at the FH, or a non-zero peak output power of an outgoing pulse signal at the SH;

arranging for at least one input port and at least one output port defining at least one optical path of the selected relations.

30. The method according to Claim 29, comprising the design of the element with mirror surfaces so as to form between the input and output ports at least one multi-segment trajectory resulting from internal reflections in the element.

31. The method according to Claim 28 comprising, for effective pulse shaping, the selecting of the SHG element with smaller values of its mismatch parameter.